

What is claimed is:- 34 -

~~Patent Claims:~~

1. Process for producing molded bodies with a barrier layer, especially molded bodies for packaging, from biodegradable material using a viscous mass which contains biodegradable fiber material, water, and starch and is baked in a baking mold so as to form a fiber material-starch composite, characterized in that a mixture of long and short fibers or fiber bundles with a fiber length or fiber bundle length in the range of 0.5 mm to 50 mm is used as fiber material, and the molded body is produced by impregnation with a biodegradable, hydrophobic boundary layer, wherein the boundary layer is formed from cellulose acetate and/or cellulose acetate propionate without softeners.

2. Process for producing molded bodies with a barrier layer, especially molded bodies for packaging, from biodegradable material using a viscous mass which contains biodegradable fiber material and starch and is baked in a baking mold so as to form a fiber material-starch composite, characterized in that a mixture of long and short fibers or fiber bundles with a fiber length or fiber bundle length in the range of 0.5 mm to 50 mm is used as fiber material and the molded body is produced by means of a foil coating formed by applying a foil based on polyester, polyester amide or polylactic acid to the baked molded body so as to form a biodegradable, liquid-tight boundary layer.

3. Process according to claim 2, characterized in that the biodegradable boundary layer is formed without softeners.

4. ~~The process~~ ~~Process~~ according to claim 2 or 3, characterized in that the foil has a thickness of between 20 μm and 200 μm .

5. ~~The process~~ ~~Process~~ according to claim 1, characterized in that the impregnation is carried out by spraying on, casting or dipping with a hydrophobic solution.

6. Process according to at least one of the preceding claims 2 to 4, characterized in that the foil coating is carried out by vacuum heat sealing or compression heat sealing and/or with heat treatment.

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7. Process according to at least one of the preceding claims 1 to 6, characterized in that the impregnation or foil coating is elastic and is preferably applied directly to the molded body without adhesion promoters.

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8. Process according to at least one of the preceding claims 2 to 4, 6 or 7, characterized in that the foil is heated at its underside intended for adhesive connection with the molded body.

1 2 3 4 5 6 7 8 9 10 11 12

9. Process according to at least one of the preceding claims 2 to 4, 6 to 8, characterized in that the foil is prestretched prior to application to the molded body by means of a male die, especially for hollow molded bodies.

10. Process according to at least one of the preceding claims 2 to 4, 6 to 9, characterized in that at least the adhesion surface of the molded body to be coated with foil is preheated prior to coating with foil to the melting temperature of the foil and the foil is then applied thereto.

11. Process according to at least one of the preceding claims 1 to 10, characterized in that the hydrophobic boundary layer is formed by impregnation or a liquid-tight barrier layer by applying a foil to the molded body when it is still hot from the preceding baking process and the molded body is conditioned simultaneously or subsequently.

12. *The process* *claim 1* ~~Process according to at least one of the preceding claims 1 to 11,~~

characterized in that a thickness of the hydrophobic, biodegradable boundary layer is 5 µm to 200 µm.

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13. Process according to at least one of the preceding claims 1 to 12, characterized in that the molded body is provided with the boundary layer on the inside and/or on the outside.

The process *claim 1* *wherein*

14. ~~Process according to claims 1 to 5, 7, or 11 to 13, characterized in that the impregnation is applied as a multiple layer.~~

The process *claim 1* *wherein*

15. ~~Process according to at least one of the preceding claims 1 to 14, characterized in that the boundary layer serving as barrier layer has a barrier effect against liquids, especially water, acidic foodstuffs and fats.~~

The process *claim 1* *wherein*

16. ~~Process according to claim 15, characterized in that the boundary layer forms a substantially liquid-tight and gastight barrier layer against steam, oxygen and aromas.~~

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17. Process according to at least one of the preceding claims 1 to 16, characterized in that an inner boundary layer of the molded body has a greater resistance to moisture and/or temperature and/or fats and/or is more tightly sealed against gas and aromas than an outer surface of the molded body, especially an outer surface provided with a hydrophobic boundary layer.

18. Process according to at least one of the preceding claims 1 to 17, characterized in that the molded body is provided along an inner surface with a hydrophobic impregnation or coating which is thicker than that on its outer surface.

19. Process according to at least one of the preceding claims 1 to 18, characterized in that the molded body is baked in the baking mold, subsequently removed from the baking mold and introduced into a further device within the baking apparatus for applying the hydrophobic impregnation or foil coating.

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20. Process according to at least one of the preceding claims 1 to 19, characterized in that for subsequent impregnation or coating of the molded body, use is made of process heat of the baking mold, preferably within the baking mold, or residual heat of the molded article from the preceding baking process to heat the molded body and/or to heat a hydrophobic medium, especially a coating foil, to be applied to the molded body.

21. Process according to at least one of the preceding claims 1, 5, 7 or 11 to 20, characterized in that a solution containing cellulose acetate and/or cellulose acetate propionate as hydrophobic substance and a solvent, especially a volatile solvent, is used for impregnation.

22. Process according to at least one of the preceding claims 2 to 4, 6 to 10, characterized in that the foil is trimmed at the coated molded body after the molded body is removed from the baking mold in conjunction with a severing of overlapping material resulting from the steam discharge ducts of the baking mold.

23. Process according to at least one of claims 1 to 23, characterized in that fiber-containing raw material which is pulped or defibrated in particular by prior comminution is used to form the fiber material.

24. Process according to at least one of the preceding claims 1 to 23, characterized in that the fiber-containing raw material is waste paper, recycled material, especially deinked waste paper, biodegradable fiber material such as production waste containing cellulose fibers, especially wood pulp or paper pulp, beet chips or the like.

25. Process according to at least one of the preceding claims 1 to 24, characterized in that the fiber material is formed directly from biodegradable fibers or fiber bundles.

The process
a ~~26. Process according to claim 25, characterized in that the fibers or fiber~~
bundles have a length ranging from 0.5 mm to 5 mm.

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27. Process according to at least one of the preceding claims 1 to 25,
characterized in that the starch used is native starch and/or pregelatinized starch or
modified starch.

The process
28. ~~Process according to at least one of the preceding claims 1 to 27,~~
~~characterized in that the ratio of starch to fiber material in the viscous mass is in the~~
~~range from 15 percent by weight to 400 percent by weight in relation to the dry~~
~~weight of the fiber-containing raw material, especially waste paper.~~

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29. Process according to at least one of the preceding claims 1 to 28,
characterized in that water is added in a ratio of approximately 8:10, preferably
2.5:1, in relation to the dry mass of the fiber-containing raw material, especially
waste paper, for forming the viscous mass.

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30. Process according to at least one of the preceding claims 27 to 29,
characterized in that the proportion of pregelatinized starch or modified starch of the
total starch in the viscous mass is approximately 20 to 75 percent by weight.

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31. Process according to at least one of the preceding claims 1 to 30,
characterized in that the proportion of starch to water in the viscous mass is
approximately 1:10 to 1:1, preferably 1:3 to 1:2, and water is subsequently added in
the form of modified starch or starch which is pregelatinized accompanied by excess
water to form the viscous mass.

32. Process according to at least one of the preceding claims 1 to 31,
characterized in that the portion of fiber material in the viscous mass is 10 percent
by weight to 30 percent by weight, the proportion of starch in the viscous mass is 5

percent by weight to 40 percent by weight, and the proportion of water in the viscous mass is 70 percent by weight to 40 percent by weight.

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33. Process according to at least one of the preceding claims 27 to 32, characterized in that the proportion of pregelatinized starch or modified starch in the viscous mass is 1 percent by weight to 13 percent by weight.

34. Process according to at least one of the preceding claims 1 to 33, characterized in that the fiber-containing raw material, especially waste paper, is comminuted and subsequently broken down to its fiber structure in the presence of water and with the addition of starch, preferably native starch, and the moldable viscous mass is formed and subsequently baked to form molded bodies.

35. Process according to at least one of the preceding claims 1 to 33, characterized in that the fiber-containing raw material, especially waste paper, is comminuted in the presence of water and is subsequently broken down to its fiber structure with the addition of starch, preferably native starch, and the moldable viscous mass is formed and subsequently baked to form molded bodies.

36. Process according to at least one of the preceding claims 1 to 35, characterized in that the viscous mass is metered prior to baking.

37. Process according to at least one of the preceding claims 1 to 36, characterized in that the fiber-containing raw material or the fiber material that is used directly is analyzed with respect to its fiber length and starch proportion and is graded prior to or after the comminuting process.

38. Process according to at least one of the preceding claims 1 to 37, characterized in that the native starch is added in partially already during a comminution of the fiber-containing raw material, especially as a premix with filler materials.

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39. Process according to at least one of the preceding claims 1 to 40, characterized in that the starch is added to the fiber-containing raw material, at least partially, during the comminuting process and/or during a subsequent drying process or wet mixing process and/or during a subsequent equalizing mixing and kneading process as native starch and/or modified starch and/or pregelatinized starch.

40. Process according to at least one of the preceding claims 27 to 39, characterized in that the starch is introduced as pregelatinized starch and as native starch and at least a filler material is added into the native starch prior to adding in the comminuting process of the fiber-containing raw material or in the subsequent equalizing mixing and kneading process.

41. Process according to at least one of the preceding claims 27 to 40, characterized in that the pregelatinized starch is added directly to the mixing and kneading process for forming the viscous mass.

42. Process according to at least one of the preceding claims 1 to 41, characterized in that the formation of the viscous mass is carried out using fiber-containing raw material of different grades of comminution and different fiber lengths.

43. Process according to at least one of the preceding claims 1 to 42, characterized in that the mass is heated before introducing it into the baking mold.

44. Process according to at least one of the preceding claims 1 to 43, characterized in that the at least two baking plates of the baking mold are locked relative to one another at the beginning of the baking process while ensuring a constant distance between the upper baking plate and lower baking plate during the baking process, wherein the distance between the inner surfaces of the baking

~~plates which face one another and between which the mass is located determines the wall thickness of the baked molded body.~~

45. Process according to at least one of the preceding claims 1 to 44, characterized in that a controlled discharge of steam from the baking mold is carried out during the baking process.

46. ~~Process according to claim 45, characterized in that the discharge of steam from the mold cavity of the baking mold is carried out so as to be controlled with respect to time and/or location and/or internal pressure.~~

47. Process according to at least one of the preceding claims 1 to 46, characterized in that long fibers or long fiber bundles with a length of up to 50 mm are preferably used for thick-walled and/or large-area molded bodies, especially fibers or fiber bundles with a fiber length or fiber bundle length in the range of 10 mm to 50 mm in a mixture with short fibers or short fiber bundles with a fiber length or fiber bundle length of 0.5 mm to 20 mm.

48. Molded body, especially molded body for packaging, made from biodegradable material, comprising biodegradable fiber material, starch and a residual proportion of water, especially produced in accordance with the process according to at least one of the preceding claims 1 to 47, characterized in that the molded body has a mixture of long and short fibers or fiber bundles with a fiber length or fiber bundle length of 0.5 mm to 50 mm, and has, on at least one side, a biodegradable hydrophobic boundary layer which is formed based on cellulose acetate or cellulose acetate propionate without softeners or has a coating foil based on polyester, polyester amide or polylactic acid.

49. ~~Molded body according to claim 48, characterized in that the molded body is covered on all sides.~~

The molded

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50. ~~Molded~~ body according to claim 49, characterized in that long fibers or long fiber bundles with a length of up to 50 mm are ~~preferably~~ used for thick-walled and/or large-area molded bodies, especially fibers or fiber bundles with a fiber length or fiber bundle length in the range of 10 mm to 50 mm in a mixture with short fibers or short fiber bundles with a fiber length or fiber bundle length of 0.5 mm to 20 mm.

51. Molded body according to at least one of the preceding claims 48 to 50, characterized in that the proportion of fiber material to starch is 4:1 to 1:4.

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52. Molded body according to at least one of the preceding claims 48 to 51, characterized in that the molded body contains a proportion of pregelatinized starch or modified starch.

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53. Molded body according to at least one of the preceding claims 48 to 51, characterized in that the molded body contains a mixture of, in particular, long, loosened fiber bundles and, in particular, short individual fibers or fiber bundles.

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